Small Business Innovation Research/Small Business Tech Transfer

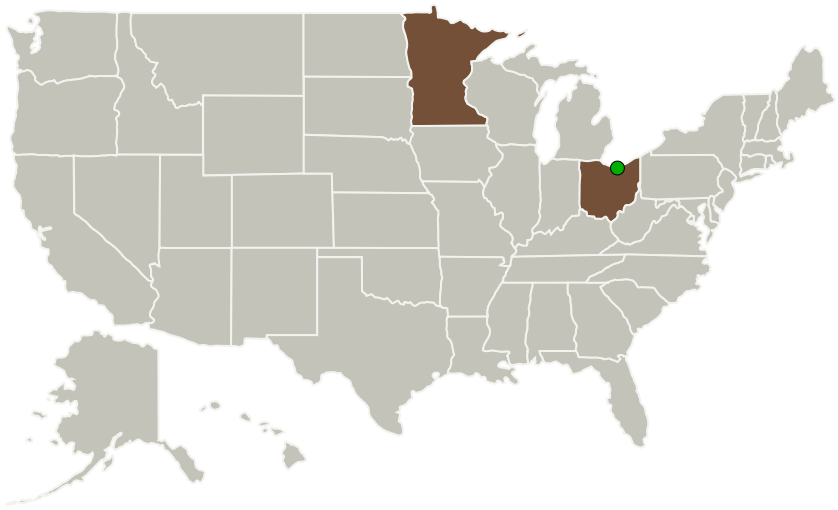
Integrated Spacecraft Navigation and Communication Using Radio, Optical, and X-rays, Phase I

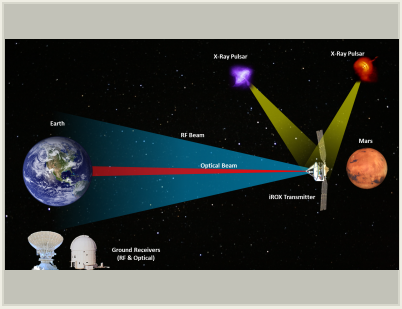
Completed Technology Project (2014 - 2014)

Project Introduction

This program proposes to design and evaluate novel technology of X-ray navigation for augmentation and increased capability of high data-rate spacecraft communications. NASA's current concept for an integrated radio and optical communications (iROC) system is being developed to provide communication technology that does not constrain the science yield of their deep space missions. iROC requirements include accurate navigation and pointing solutions so narrow optical beams are precisely transmitted directly to their Earth-based reception stations. X-ray source techniques and methods have been successfully demonstrated to determine independent position and attitude solutions for deep space vehicles. Therefore, ASTER Labs proposes to integrate the X-ray sensors directly into the iROC concept, such that the combined radio, optical, and X-ray system, referred to as iROX, can operate over a wide variety of applications and missions, increasing NASA's capability to explore the solar system. The top-level goals are to evaluate the integrated system and design a prototype detector system that augments the existing iROC concept, evaluate the performance of the integrated iROX system, and identify the feasibility and capability of such a system based upon the design architecture. The successful completion of the integrated navigation capabilities into the full iROX program will provide independent km-level position accuracies throughout the solar system and sub-arcsecond pointing capabilities, such that iROX data transfer will achieve high rates (Gbps-level) for NASA's unique deep space missions with improved capabilities over today's techniques.

Primary U.S. Work Locations and Key Partners





Integrated Spacecraft Navigation and Communication Using Radio, Optical, and X-rays Project Image

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Organizations Performing Work	Role	Type	Location
ASTER Labs, Inc.	Lead Organization	Industry Small Disadvantaged Business (SDB)	Shoreview, Minnesota
Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations	
Minnesota	Ohio

Project Transitions

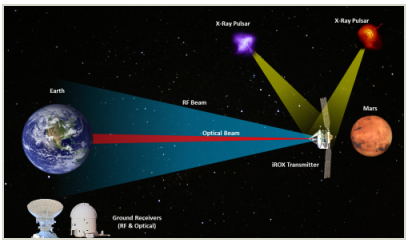
June 2014: Project Start

December 2014: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/137759)*

Images



Project Image
Integrated Spacecraft Navigation and Communication Using Radio, Optical, and X-rays Project Image *(https://techport.nasa.gov/image/134165)*

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
ASTER Labs, Inc.

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

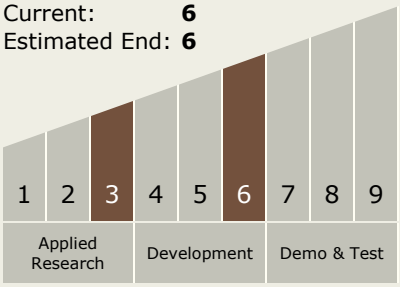
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Suneel I Sheikh

Technology Maturity (TRL)

Start: **3**
Current: **6**
Estimated End: **6**



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Technology Areas

Primary:

- TX05 Communications, Navigation, and Orbital Debris Tracking and Characterization Systems
  - TX05.5 Revolutionary Communications Technologies
    - TX05.5.3 Hybrid Radio and Optical Technologies

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System